Trailblazer
A Federation for
Joint Experimentation

High Level Architecture

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Background

- **Trailblazer/Pegasus represents the continuing evolution of DMSO's interest in supporting the M&S requirements for Joint Experimentation**

- **Program initiated in FY98 as part of DDR&E-sponsored "Joint Warfighting Program" (JWP)**
  - **Intended to improve the information superiority of US military forces through the exploration and co-evolution of technologies, doctrine and organizations**
  - **DDR&E identified DMSO as the agent for JWP M&S**

- **In FY98 DMSO**
  - **developed a working example of the application of DoD standards and infrastructure to JV2010 experimentation**
  - **conducted a "Trailblazer" activity to rapidly execute the end-to-end process of using HLA federations to an example experiment.**

Trailblazer Objectives

- **DMSO objective:**
  - Explore the use of federations in experimentation arena
  - Capture lessons learned to improve application of M&S
- **Specific guidance:**
  - Use the High Level Architecture
  - Distribute development at federate home sites
  - Conduct integration and execution at single site in DC area
  - Operate at a classified, but no higher than collateral SECRET, level
  - Complete development within fixed budget and schedule (<5 months)
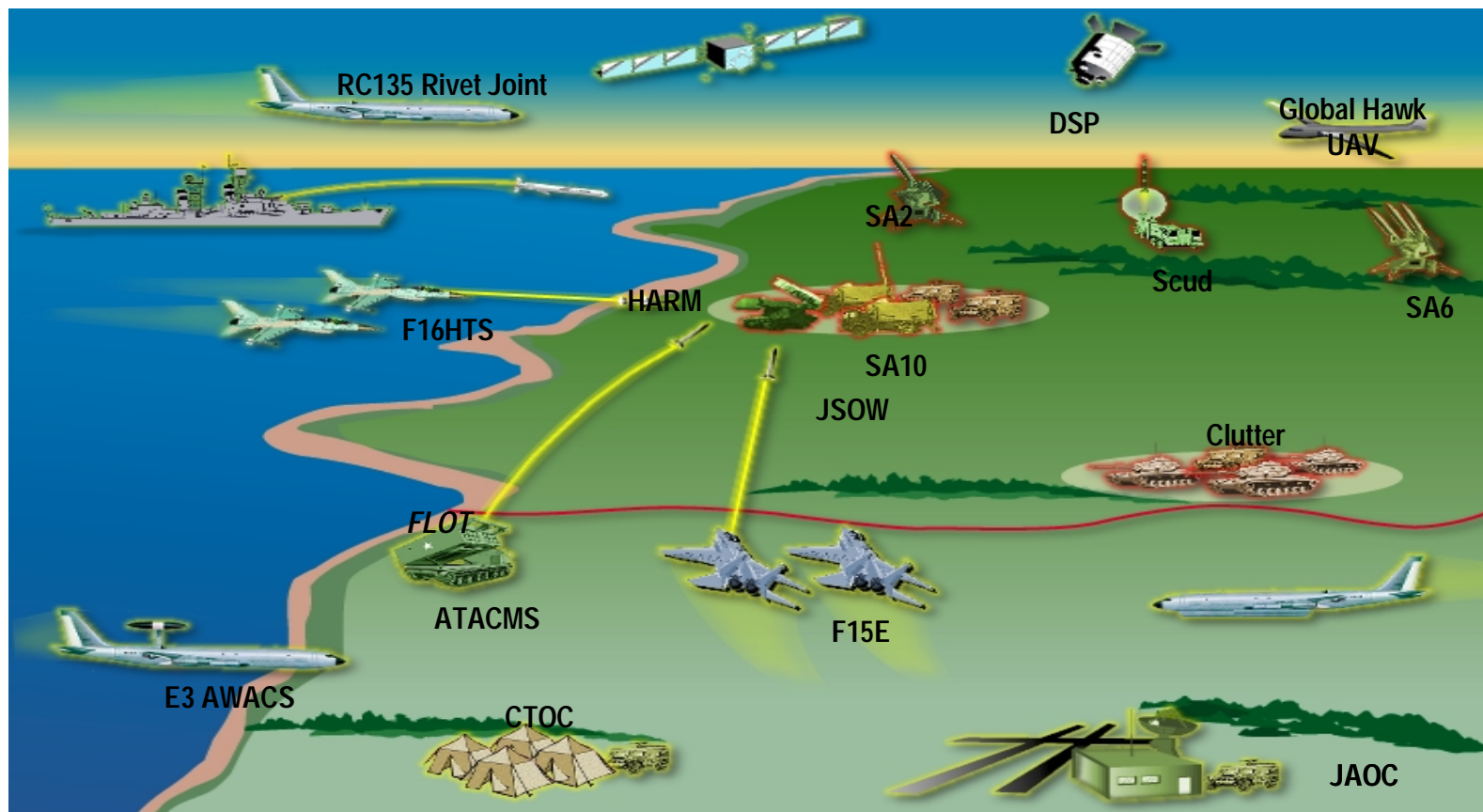 - Consider closed loop, faster-than real time simulations

FEDEP Overview

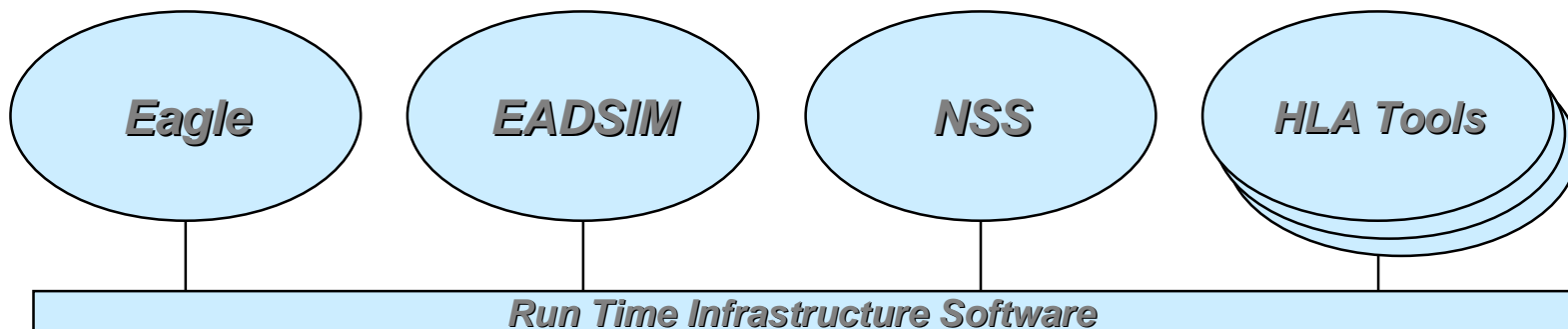| Define Federation Objectives	Develop Federation Conceptual Model	Design and Develop Federation	Integrate and Test Federation	Execute Federation and Analyze Results
Identify Sponsor Needs Develop Objectives	Develop Scenario Perform Conceptual Analysis Develop Federation Requirements	Design Federation Develop Federation	Plan Execution Integrate Federation Test Federation	Execute Federation Analyze Results Prepare Feedback

Trailblazer Battlespace

2010 JSEAD against mobile SAMs

- **Adopted high priority experiment from J-6 plan[1]**
- **J-6 LIVEX of same experiment conducted in FY98**

[1]"JV2010: Information Superiority Implementation and Assessment Plan (U)", Joint Staff (J-6), 30 September 1997 (SECRET)

Trailblazer Federation Composition

Eagle   EADSIM   NSS   HLA Tools

Run Time Infrastructure Software

Federates

Eagle	Extended Air Defense Simulation	Naval Simulation System	HLA Tools
TRADOC ANALYSIS CENTER		SPAWAR	MÄK TECHNOLOGIES
SAIC Science Applications International Corporation An Employee-Owned Company	MITRE	METRON	Virtual Technology Corporation Software and Systems Engineering Professionals
	TELEDYNE BROWN ENGINEERING Common sense . . . uncommon innovation		

Functionality

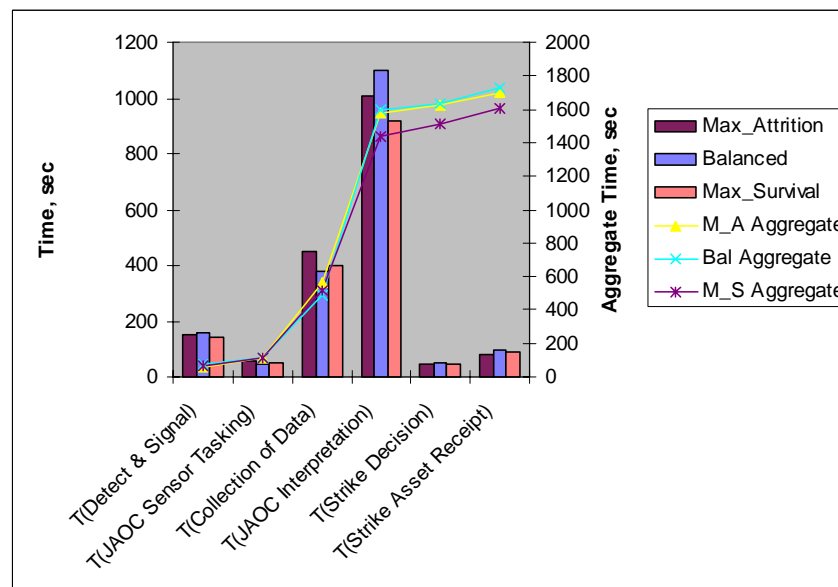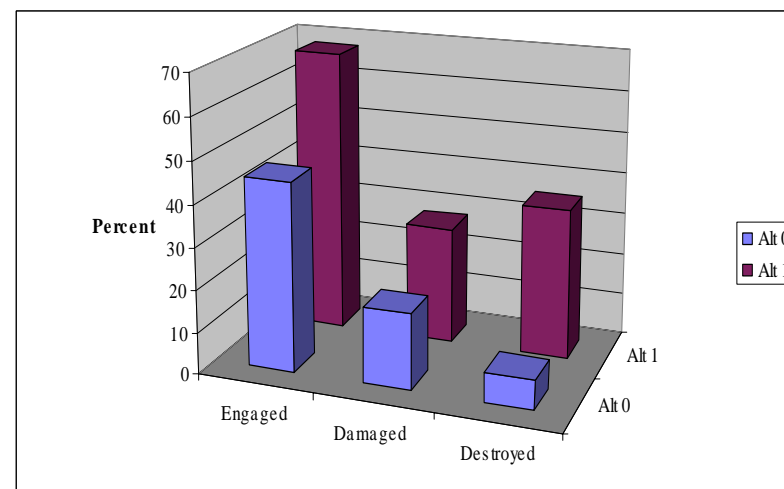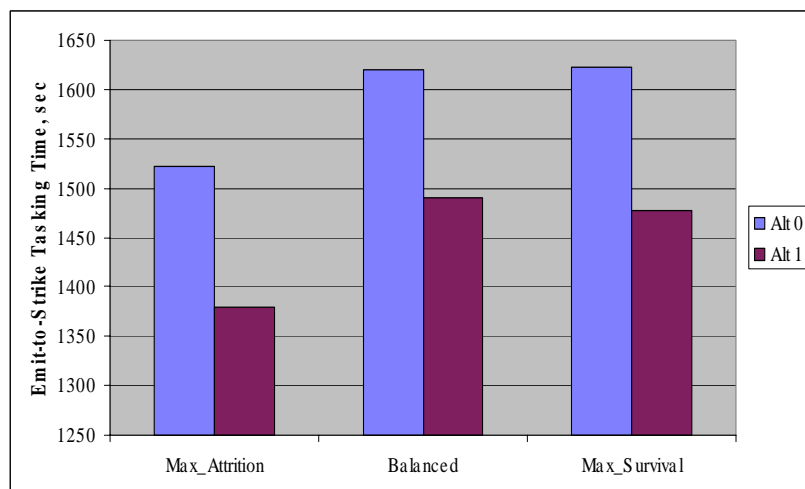|		
Red ground clutter	Red strategic SAMs	Aggregate ELINT
Red tactical SAMs	Air Force strike a/c	Infrared launch detection
CTOC	JSTARS, AWACS	Naval strike a/c
ATACMS	JAOC	

Sponsor: **DMSO**

Systems Engineer: **MITRE** - Washington

Prototypical Experimental Results

Summary: Federations for Joint Experimentation

- **Federations will be necessary for many joint experimentation-focused issues**

  - For experimentation, federates must have explicit and flexible representations of systems, humans, and C2 organizations

  - Flexibility can be enhanced by interfaces to other simulations, systems, or federates

- **The HLA provides the common architecture, tools, and processes to meet new requirements in a fast and cost-effective manner**

  - Use of HLA enables improved interoperability and reduces technical integration costs

  - Allows users to focus on more fundamental challenges of experimentation (e.g., problem definition, scenario development, data collection and interpretation, etc.)
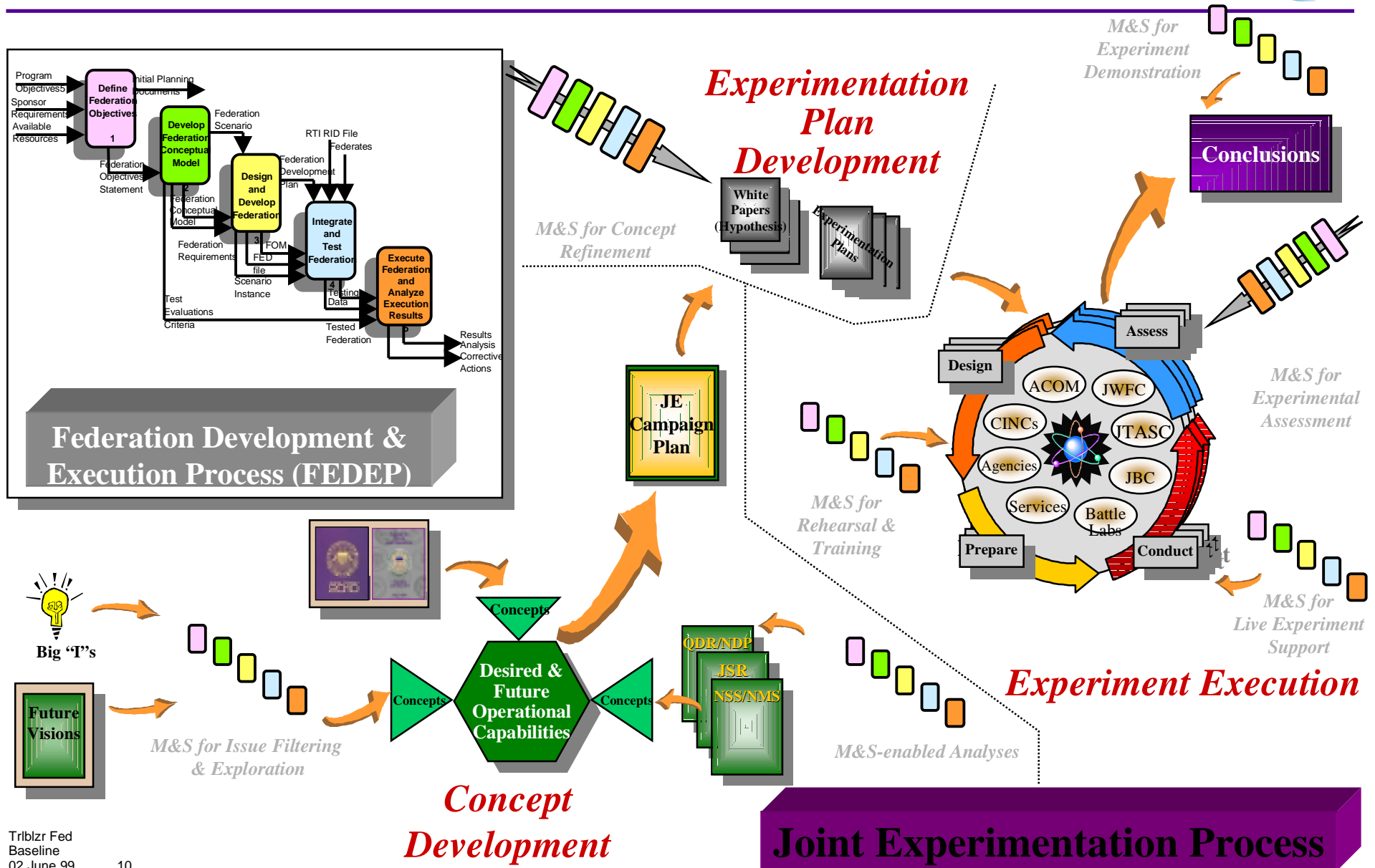
Evolution to Pegasus

- **Trailblazer effort successfully concluded by end of FY98**
  - Completed entire FEDEP including generation of prototypical analytical results
- **Project and federation re-named Pegasus in early FY99**
- **USACOM J9 has expressed interest in employing Pegasus as a tool in analysis of AOACMT**
  - Concept focus is Attack Operations Against Critical Mobile Targets in 2010 timeframe
  - Primary target set is tactical ballistic missiles (TBMs)
- **Degree of overlap between objects and interactions in current federation and AOACMT make Pegasus a particularly attractive capability**

Laying the Foundation for Joint Experimentation

Federation Development & Execution Process (FEDEP)

Experimentation Plan Development

Concept Development

Experiment Execution

Joint Experimentation Process

JE Campaign Plan

White Papers (Hypothesis)

Conclusions

M&S for Concept Refinement

M&S for Issue Filtering & Exploration

M&S-enabled Analyses

M&S for Rehearsal & Training

M&S for Experimental Assessment

M&S for Live Experiment Support

M&S for Experiment Demonstration

Big "I"s

Future Visions

Desired & Future Operational Capabilities

Concepts

QDR/NDP
JSR
NSS/NMS

Design
Assess
Prepare
Conduct

ACOM JWFC
CINCs JTASC
Agencies JBC
Services Battle Labs

Trlblzr Fed Baseline
02 June 99   10

The Road Ahead

- **Currently exploring technological enhancements to the FEDEP in support of the JE domain**
  - Continue to enhance the application of the HLA to JE
- **Making operational enhancements to the Pegasus federation**
  - Provide powerful, flexible analytical tool to USACOM for use in AOACMT and other emerging concepts
- **Ongoing explorations:**
  - Scenario agility
  - Common / more detailed representations
  - Performance enhancement
  - Data collection and reduction
  - Distributed classified operations
  - Multi-level operations with SCI level federates
- **Anticipate federation being ready for early FY00 operational use by USACOM J9**